Message

From:	Davis, Eva [Davis.Eva@epa.gov]
Sent:	4/4/2017 7:51:29 PM
To:	Wayne Miller [Miller.Wayne@azdeq.gov]; d'Almeida, Carolyn K. [dAlmeida.Carolyn@epa.gov]; d p [DPope@css-dynamac.com]
CC:	steve [steve@uxopro.com]; Brasaemle, Karla [KBrasaemle@TechLawInc.com]; Cosler, Doug [DCosler@TechLawInc.com]
Subject:	RE: 2017-4-3 - Williams AFB - ADEQ evaluation of AMEC Stu Pearson 3-29-2017 E-mailed responses to Agency comments - AMEC follow up to the Mar 16 2017 BCT Call - ST012 EBR - spearson amec for dsmallbeck

Wayne –

I have no problems with your responses. I think there are other things in their presentation and in their response to comment/questions that we also need to respond to. I'm also looking for input from the others.

- In their presentation on the mass calculations, they stated they estimated mass in the new areas based on the average soil TPH data they collected from the borings. They didn't have many TPH results, only 5 results are listed on the slides. Even the highest measured TPH (16,500 mg/kg) is not really indicate of mobile LNAPL. However, LNAPL accumulations have been measured in newly installed wells UWBZ32, UWBZ33/LSZ48, LSZ43, LSZ46, LSZ49, and LSZ50. Using the average soil TPH to estimate mass in these areas is going to severely underestimate the amount of mass in those areas. None of their LNAPL extent estimates show LNAPL extending to LSZ43, however, 22 gallons of LNAPL have been recovered from this well. They also ignore the area of where UWBZ37 was to be installed, although significant PID readings were recorded in that area in the CZ and UWBZ.
- In AMEC's March 29 responses, #4, they say that the higher Kd would not result in a significant change to the overall mass at the site, since most of the mass at the site is LNAPL. In the modeling they did, it appears that most of the benzene in the LNAPL was eliminated (or at least significantly depleted) in 1.5 years of EBR, as the concentrations predicted to remain after that time period relatively low. Meaning that most of the benzene mass remaining during the last 15 years of their model was dissolved and adsorbed phase, when the foc used would make a significant difference.

Eva

From: Wayne Miller [mailto:Miller.Wayne@azdeq.gov]
Sent: Monday, April 03, 2017 1:57 PM
To: d'Almeida, Carolyn K. <dAlmeida.Carolyn@epa.gov>; Davis, Eva <Davis.Eva@epa.gov>; d p <DPope@css-dynamac.com>
Cc: steve <steve@uxopro.com>
Subject: 2017-4-3 - Williams AFB - ADEQ evaluation of AMEC Stu Pearson 3-29-2017 E-mailed responses to Agency comments - AMEC follow up to the Mar 16 2017 BCT Call - ST012 EBR - spearson amec for dsmallbeck

Carolyn, Eva, Dan: FYI – my intent is to send the following message to AMEC (Don and Stu) and USAF (Catherine) Tues., 4-4-2017 noon-ish if you have no objections.

ADEQ and our contractor UXO Pro evaluated AMEC's Mar 29 2017-emailed response to comments [RTCs] to agency-posed questions/comments during the March 16, 2017 Base Closure Team (BCT) conference call. ADEQ evaluation follows:

2. Question on the amount of LNAPL removed from inside vs. the TTZ perimeter or outside the TTZ.

Amec Statement

a. It was clarified during the call that the statement on the slide was intended to characterize the entire post SEE period rather than just the period since the January BCT call.
b. During the period from 13 Jan through 17 March approximately 600 gallons of LNAPL was removed. In the UWBZ approximately 8 gallons came from interior wells out of 109 gallons removed. In the LSZ approximately 237 gallons came from the interior out of 485 gallons removed. (note: we do not account for LSZ16 as an interior well in these estimates based on the lack of another well positioned between LSZ16 and the TTZ perimeter)

ADEQ Response
For the period 13 Jan through 11 March, Slide 8 and its legend indicate the total NAPL volume removed from the UWBZ was about 100 gallons including UWBZ01 (25 gal), UWBZ05 (5 gal), UWBZ06 (4 gal) and UWBZ20 (68 gallons). The first three wells are located in the TTZ directly between former steam injection wells. UWBZ20 is located directly west of former steam injection wells UWBZ13 and UWBZ15 on the edge of the TTZ as defined in the Work Plan. In addition, UWBZ15 has consistent NAPL detections including 1.5 feet on 1/27/17 and previous NAPL removal despite its use as a steam injection well. Based on these observations, the majority of the NAPL recovered in the cited period came from the interior and edge of the designed TTZ.

For the period 13 Jan through 11 March, Slide 10 and its legend indicate the total NAPL volume removed from the LSZ was about 485 gallons. Of this total, about 25% was recovered from LSZ30 located in the middle of four former steam injection wells. Well LSZ16 is located between former steam injection wells LSZ03 and LSZ18 and former SEE extraction well LSZ28 is located to the northwest on the perimeter placing LSZ16 in the interior of the TTZ. Approximately 120 gallons were removed from this well indicating 357 of 485 gallons were recovered from the TTZ interior of the LSZ. Based on these observations, the majority of the NAPL recovered in the cited period came from the interior of the TTZ.

3. Request to include baseline microbiological testing.

Amec Statement
a. The addition of baseline qPCR and PLFA will be added for six wells to baseline sampling prior to EBR injections. This will include two wells in each of the three zones (CZ, UWBZ, and LSZ) and will be the same wells proposed for subsequent testing post injections.

ADEQ Response
The addition of pre-EBR baseline samples is appropriate. At least one sample from each zone needs to be collected from within the Thermal Treatment Zone close to a known LNAPL area, preferably in an area that saw significant heating during SEE, but which has cooled enough (i.e., <140°) to install the BioTrap sampler.

Amec Statement
b. SIP analysis is not proposed. The primary purpose of SIP is to demonstrate that carbon atoms from contaminants are incorporated into cell mass and dissolved inorganic carbon to prove degradation is occurring. A positive result is desired during EBR but comparison to a baseline result is irrelevant to the purpose of the test.

ADEQ Response
A positive result is needed before implementing EBR to show that a population of target-compound degraders is even present. qPCR and PLFA won't be able to confirm the presence of active biodegradation in-situ like SIP. EBR is "Enhanced BioRemediation"; bioremediation is already occurring, but we're just enhancing it and making it more effective and robust. If there is no positive SIP result prior to EBR, then it's likely the desired degrading microbes may not be there, and we need to couple our decision with available PLFA and qPCR data and consider the need for bioaugmentation. Since both PLFA and SIP analyses can be conducted from a single BioTrap sampler, it makes sense to run both analyses.

5. Discussion on incorporation of an LNAPL transfer limitation as was used in the SEAM3D code

Amec Statement

a. The site-specific LNAPL mass transfer determined during the TEE pilot was based on a continuous active pumping situation without biological enhancement. Although pumping is included in the EBR approach it is primarily for sulfate distribution over a period of several weeks after which pumping ceases. Enhancement of dissolution by biosurfactants is also expected to occur which would have a positive effect on LNAPL mass transfer which is not accounted for in the TEE pilot determination.
b. The MODFLOW-SURFACT code is sufficient as an engineering tool for the purposes of establishing a baseline estimate of EBR performance and duration and evaluating optimization approaches as EBR proceeds. The model will be updated based on actual monitoring results and LNAPL dissolution can be adjusted, if necessary, by adjusting solubility parameters. Other parameters that may affect EBR performance will be adjusted based on monitoring results.

ADEQ Response
The mass transfer coefficients determined during the TEE pilot test provide optimistic estimates for modeling EBR. Mass dissolution is the product of the mass transfer coefficient and the concentration gradient that exists between NAPL and the bulk of surrounding water. Higher flow rates increase the mass transfer coefficient and increase the concentration gradient. On the scale of modeling (several feet), the NAPL and water may be near equilibrium when the flow rate is low (i.e., the residence time of water in a given volume is long allowing near equilibrium conditions). The high flow rates during the mass transfer test created dis-equilibrium by lowering the residence time to allow a determination of the mass transfer coefficient. The EBR process is different in that mass transfer from the NAPL will be promoted by increasing the concentration gradient, with no change in the existing mass transfer coefficient (unless the biosurfactant effect is appreciable). If successful in rapidly degrading the dissolved phase concentration, the dissolution rate will become limited by the mass transfer coefficient between the NAPL and bulk surrounding water.

From: Pearson, Stuart C. [mailto:Stuart.Pearson@amecfw.com]
Sent: Wednesday, March 29, 2017 11:03 AM
To: d'Almeida, Carolyn K. <dAlmeida.Carolyn@epa.gov>; Wayne Miller <Miller.Wayne@azdeq.gov>
Cc: MOOK, PHILIP H JR GS-15 USAF AFCEC AFCEC/CIBW <philip.mook@us.af.mil>; Anderson, Scott J <Scott.Anderson@amecfw.com>; Davis, Eva <Davis.Eva@epa.gov>; Dan Pope <DPope@css-dynamac.com>; steve@uxopro.com; Willis, Shannon (Arizona) <shannon.willis2@amecfw.com>; Bo Stewart <bo@praxis-enviro.com>; Henning, Loren <Henning.Loren@epa.gov>; Brasaemle, Karla <KBrasaemle@TechLawInc.com>; Rohrbaugh, Amanda <ARohrbaugh@TechLawInc.com>; Guerra, Peter A <Peter.Guerra@amecfw.com>; Smallbeck, Donald R. <Donald.Smallbeck@amecfw.com>; JERRARD, CATHERINE V CIV USAF HAF AFCEC/CIBW <catherine.jerrard@us.af.mil>
Subject: 2017-3-29 - WAFB - responses to Agency comments - March 16 2017 BCT Call Follow Up - ST012 EBR - spearson amec for dsmallbeck

BCT members,

Please see below for responses to comments and questions that came up during our March BCT call. Cathy has reviewed and concurred on the responses. I am sending the message as she currently does not have access to email and Don is traveling.

1. Difference in LNAPL extent characterization in the Cobble Zone between the Draft Final Addendum 2 (Figure B-1) and Figures 1&2 recently distributed before the BCT call.

   a. The presence of LNAPL in the CZ at LSZ23 was interpreted based positive dye tests at depths of 135 and 165 ft bgs (i.e., above and below the CZ). The original LNAPL interpretations assumed positive dye test kits applied to all depths below the test depth until the next dye test result was encountered (very conservative approach). At LSZ23 the PID readings were 2,258 ppmv at 135 ft bgs but decreased to 8.1 ppmv at 145 ft bgs (the approximate top of the CZ). PID values at LSZ23 increased to 1,300 at 160 ft bgs. PID readings indicate that the positive dye tests at 135 ft and 165 ft should not be interpreted that residual LNAPL is continuously present in the CZ. When LNAPL extents were updated follow the EBR drilling, previous boring logs were reviewed and LNAPL interpretations were updated to consider PID readings.

2. Question on the amount of LNAPL removed from inside vs. the TTZ perimeter or outside the TTZ.

    a. It was clarified during the call that the statement on the slide was intended to characterize the entire post SEE period rather than just the period since the January BCT call.
    b. During the period from 13 Jan through 17 March approximately 600 gallons of LNAPL was removed. In the UWBZ approximately 8 gallons came from interior wells out of 109 gallons removed. In the LSZ approximately 237 gallons came from the interior out of 485 gallons removed. (note: we do not account for LSZ16 as an interior well in these estimates based on the lack of another well positioned between LSZ16 and the TTZ perimeter)

3. Request to include baseline microbiological testing.

    a. The addition of baseline qPCR and PLFA will be added for six wells to baseline sampling prior to EBR injections. This will include two wells in each of the three zones (CZ, UWBZ, and LSZ) and will be the same wells proposed for subsequent testing post injections.
    b. SIP analysis is not proposed. The primary purpose of SIP is to demonstrate that carbon atoms from contaminants are incorporated into cell mass and dissolved inorganic carbon to prove degradation is occurring. A positive result is desired during EBR but comparison to a baseline result is irrelevant to the purpose of the test.

4. Comment on calculated kd being excessively low where foc values are low.

    a. Kd values utilized in the EBR model are based on values previously used for the site based on actual field data.
    b. If Kd values were higher as suggested by the comment, it would result in reduced concentration dissolved phase concentrations. By utilizing a higher Kd value in the model, the model would show achieving conditions where the flux of contaminants into dissolved groundwater is addressed by the background flux of TEA sooner than currently predicted by the model (i.e., the current model is sufficiently conservative)
    c. The overall mass at the site is dominated by the LNAPL. The additional sorbed mass associated with a higher kd would not result in a significant change in the overall mass at the site. This is an important consideration; Kd is the equilibrium constant between dissolved and solid phases which both represent a small fraction of the total mass in the presence of LNAPL.

5. Discussion on incorporation of an LNAPL transfer limitation as was used in the SEAM3D code

    a. The site-specific LNAPL mass transfer determined during the TEE pilot was based on a continuous active pumping situation without biological enhancement. Although pumping is included in the EBR approach it is primarily for sulfate distribution over a period of several weeks after which pumping ceases. Enhancement of dissolution by biosurfactants is also expected to occur which would have a positive effect on LNAPL mass transfer which is not accounted for in the TEE pilot determination.
    b. The MODFLOW-SURFACT code is sufficient as an engineering tool for the purposes of establishing a baseline estimate of EBR performance and duration and evaluating optimization approaches as EBR proceeds. The model will be updated based on actual monitoring results and LNAPL dissolution can be adjusted, if necessary, by adjusting solubility parameters. Other parameters that may affect EBR performance will be adjusted based on monitoring results.

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